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ABSTRACT

The Cranston Secondary School Curriculum Guide (9-12) for Industrial Arts is intended to serve as a resource for teachers, students, department chairman, guidance personnel, curriculum planners, and others involved in present or future curriculum planning. At least one broadly stated major objective is provided for each section, encompassing the work of large units or entire sections followed by numbered objectives which are detailed and specific, and intended to indicate the level of learning (the congnitive, affective, and psychomotor domains), the content (what will be learned), and the means of evaluation. These are followed by suggested activities which support the objectives. A unit on graphic arts if followed by 20 units on auto mechanics covering: basic hand tools and shop safety; parts and systems; engine operational theory; lubrication and maintenance services; cooling systems; tires, wheels and rims; brakes; basic electricity; batteries; ignition and cranking systems; review of auto 1; charging systems; advanced ignition systems; fuel system and carburetion; engine service; tune up and compression; front end and steering; basic auto mechanics; and auto mechanics for girls. (Author/BP)

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Secondary School

C U R R I C U L U M G U I D E

INDUSTRIAL ARTS

Prepared By

a curriculum writing team

of secondary teachers

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and

The Fifth Quarter Plan

Title III, E.S.E.A., 1965

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INTRODUCTORY NOTES

The Cranston Secondary School Curriculum Guides are intended to serve as a resource to teachers, students, department chairmen, guidance personnel, curriculum planners, and anyone else involved in present or future curriculum planning.

Teachers are urged to utilize the guides in lesson preparation and for purposes of providing individual students and groups of students with a resource; student achievement is often influenced by a knowledge of what is expected with respect to course objectives. Differences in abilities and needs among students and classes can be served by selecting appropriate objectives and activities.

The guides will also be useful for purposes of describing and communicating secondary curriculum goals to the public when such a need arises from time to time.

The organization of the guides is such that most sections present materials in terms of portions of a school year, thus making it possible for students to re-learn or make up a portion of a year's course. This is possible whether the course is offered in a full year or in shorter units of time.

GUIDE FORMAT

At least one major objective is stated for each section of the guide. Each is broad in statement encompassing the work of large units or entire sections.

Numbered objectives (Objective #1) are specific and intended to indicate the level of learning (the learning variable), the content (what will be learned), and the means of evaluation. Thus the objective describes learning in relationship to the learner. The teacher's function is to design methods which will effect the result. Most objectives in the guides are followed by "activities."

Suggested activities are intended to support the objective

to which they are assigned. Such statements either relate how the student will attain the objective or may be considered as sub-objectives.

OBJECTIVES IN TERMS OF LEARNING VARIABLES

Bloom and his colleagues devised a taxonomy of educational objectives designed to classify the behavior of students in three domains as a result of having participated in a series of instructional experiences. The three domains are the cognitive (intellectual), the affective (emotional), and the psychomotor (physical). Within each of these domains there is a hierarchy which denotes increasing complexity of learning as shown below.

Cognitive	Affective	Psychomotor
knowledge	receiving	frequency
comprehension	responding	energy
application	valuing	duration
analysis	organizing	
synthesis	characterizing	

In addition to the general technique of the behavioral statement, the authors were careful to differentiate the levels at which given behaviors could be expected of the student. Thus, in the cognitive domain a student's performance in the display of knowledge of a concept is less complex than the student's performance when he applies the concept in a given situation. Similarly, in the affective domain, a response to a situation is not as complex as the display of a value toward a given situation. Precise differentiation among variables is very difficult or, in many cases, impossible, but using these variables to formulate objectives is a means of focusing the attention of the teacher and the learner upon the existence of levels of learning.

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I. Organizational Unit

Objective #1: The student will comprehend the position of the graphic arts in the industrial arts field as demonstrated in class discussion and/or a written test.

Activities:

1. List the graphic arts shop rules and regulations.
2. List the general safety rules.
3. Identify the machines, their location and tools in the graphic arts shop.
4. Explain the student personnel organization and management plan.

Objective #2: The student will apply a knowledge of shop safety rules, management practice, and the location of essential tools and machines in the shop as demonstrated by his facility in working in the shop.

Activities:

5. Identify job related industries.
6. Identify the general purpose of the course.
7. Identify the values to be derived from the course.
8. List the important factors of the graphic arts industry.
9. Recite a brief history of the meaning of graphic arts.

II. Layout and Design Unit

Objective #3: The student will apply a knowledge of general layout and design in graphic arts as demonstrated by the satisfactory completion of an appropriate project to be judged by the teacher.

Activities:

10. Compare the similarities of a layout and a blueprint.
11. Identify ways of attracting attention.

12. Differentiate between good and poor designs.

13. Use proper color in designing.

14. Use proper type size in designing.

15. Use proper spacing in designing.

16. Differentiate between letter spacing and word spacing.

III. Four Basic Kinds of Printing

Objective #4: The student will comprehend the types of graphic arts work which can be performed in the printing shop as measured by teacher observation and/or teacher-made tests.

Activities:

17. Identify letterpress printing.

18. Identify offset printing.

19. Identify silk screen printing.

20. Identify gravure printing.

A. Letterpress Printing

21. Identify the California job case.

22. Locate any type character in the case.

23. Identify quads and spacers.

24. Set type properly in the stick.

25. Set a composing stick to measure.

26. Hold a composing stick properly.

27. Use quads and spacers properly.

28. Justify a line of type.

29. Remove type from a composing stick.

30. Tie up a type form.

31. Take a proof on the proof press.

32. Make corrections by reading a proof.

33. Wash and clean a type form.

34. Use a line gauge.

35. Distribute a line of type.

36. Clean a type case.

37. Distribute leads and slugs.

38. Lock up a type form.

39. Prepare the makeready on the job press.

40. Feed a job press.

41. Clean a job press.

42. Ink a job press.

43. Oil a job press.

44. Equalize the impression on a job press.

45. Place the form in and remove the form from the press.

46. Remove the form from the chase.

47. Replace the furniture and quoins.

B. Rubber Stamp Unit

48. Differentiate between regular foundry type and steel type used in rubber stamp making.

49. Identify the materials and equipment used to make a rubber stamp.

50. Lock up a form in a chase or chase box.

51. Make a mold or matrix impression.

52. Remove a matrix mold.

53. List the safety rules in making a rubber stamp.

54. Vulcanize a piece of rubber.

55. Differentiate between vulcanized and unvulcanized rubber.

56. Dust the matrix with mica release powder.

57. Trim the stamp for mounting.

58. Cut and finish the rubber stamp mount.

59. Adhere the rubber stamp to the stamp mount.

60. Cut the matrix to size.

61. Pre-heat the rubber stamp press.

62. Pre-heat the type.

63. Make a print using a rubber stamp.

C. Silk Screen Printing

64. Prepare a design for a single color print.

65. Prepare a design for a multi-color print.

66. Identify the various films used in screen printing.

67. Identify the various knives used to cut the film.

68. Select the proper film for the desired job.

69. Cut the film using the proper knife.

70. Differentiate between silk and organdy.

71. Use a staple gun.

72. Fasten the fabric to the frame.

73. List the safety rules in silk screening.

74. Mix the developer for the photographic film.*

75. Make a negative using a floor camera or inking method.*

76. Expose the photographic film.*

77. Develop the photographic film.*

78. Wash out the photographic film.*

*indicates optional activities.

79. Harden the photographic film.*

80. Adhere the film to the screen.

81. Block out the proper areas in the screen.

82. Identify the various kinds of inks.

83. Select the proper ink for the design.

84. Print the design on the selected material.

85. Apply a novelty finish (flock, diamond dust, etc.).

86. Clean a screen after printing.

87. List the benefits of clean tools and properly sealed ink cans.

88. List the benefits of wearing a shop apron.

D. Padding and Bookbinding Unit

89. Differentiate among the various kinds of basic pads.

90. Gather paper to form a pad.

91. Clamp the paper and cement it together.

92. Trim the cemented pad.

93. Differentiate between chipboard and bindersboard.

94. Make a cover for a pad.

95. Make a part of a book known as a signature.

96. Join the signatures of a book by sewing.

97. Make up and assemble the casing for a book.

98. Apply glue to cover materials and place the glued parts under pressure to dry.

99. List the steps on how a book is made or repaired.

100. Identify the proper means for caring for a book.

E. Linoleum Block Printing

101. Select a proper design for block printing.

*indicates optional activities.

102. Differentiate among relief, intaglio, and outline cuts.

103. Transfer the design to the block.

104. Carve the block in block printing.

105. Print the block.

106. Properly register a multi-color print.

107. List the safety rules in block printing.

108. Properly clean the block for future use.

F. Gravure Printing Unit

109. Select a proper design.

110. Identify the tools and equipment used in gravure printing.

111. Transfer the design to the acetate.

112. Ink the plate.

113. Condition the paper.

114. Adjust the pressure of the press.

115. Print the etching.

116. Mount the print for display.

117. Compare this form of printing with the modern day method.

MAJOR OBJECTIVE

THE STUDENT WILL DEMONSTRATE APPLICATION OF THE USE OF BASIC AUTOMOTIVE HAND TOOLS, AND PERFORM JOBS FOLLOWING THE SAFETY RULES OF THE SHOP AS INDICATED BY TEACHER OBSERVATION AND/OR WRITTEN TEST.

Objective #1. The student, using the necessary tools, will sucessfully perform the following activities to the satisfaction of the teacher.

Activities:

1. Cut and flare copper tubing.
2. Make a gasket.
3. Cut, strip insulation, and install a terminal on 14 gauge wire.
4. Solder terminal in job 3.
5. Torque a head bolt to 65 ft. lbs.
6. Drill and tap metal, to install 3/8 X 14 bolt.

Objective #2: The student, following the list of shop safety rules, will successfully perform the following activities to be measured by teacher evaluation.

Activities:

7. Jack a car using both bumper and floor jacks.
8. Support a jacked car with safety stands.
9. Install compressed air attachments.

Objective #3: The student will be able to identify 10 given basic automotive hand tools and state their functions as measured by a teacher-made test.

Objective #4: The student will gain knowledge of at least three shop safety rules and cite an infraction of each in an oral discussion or written test.

PARTS AND SYSTEMS

MAJOR OBJECTIVE:

THE STUDENT WILL INCREASE COMPREHENSION OF THE NAMES AND FUNCTIONS OF ENGINE POWER PLANT PARTS AS MEASURED BY A WRITTEN TEST CONSISTING OF PARTS IDENTIFICATION, FUNCTION AND PLACEMENT IN SYSTEMS.

Objective #1: The student will display knowledge of frames and chassis by correctly locating the appropriate units in his text to the satisfaction of the teacher.

Identify:

1. x type frame.
2. Box type frame.
3. Unit body construction
4. Standard U.S. arrangement of chassis parts.
5. Unorthodox method of chassis parts arrangement (ex: V.W.).

Objective #2: The student will display knowledge of engine parts by identifying fifteen out of twenty engine parts and correctly stating their functions on a written test.

Objective #3: The student will display knowledge of engine supportive systems by pointing out to the instructor two complete systems on engines set up in the shop, and state the main function of these systems.

ENGINE OPERATIONAL THEORY

MAJOR OBJECTIVE:

THE STUDENT WILL INCREASE COMPREHENSION OF 4 STROKE CYCLE PRINCIPLES AND ENGINE CONSTRUCTION BY SKETCHING AN ENGINE SHOWING ITS STROKES IN OPERATION.

Objective #1: The student will display knowledge of engine block shapes by identifying the following given shapes of blocks as measured by teacher evaluation.

Identify:

1. V.
2. Slant
3. Incline
4. Opposed

Objective #2: The student will display knowledge of engine construction types by assembling from cardboard cut-out parts the following types of engines to the satisfaction of the teacher.

Assemble:

1. Flathead
2. Overhead valve
3. Overhead cam
4. Rotary piston

Objective #3: The student will display knowledge of 4 stroke cycle principle by naming the stroke (3) when the following actions take place.

1. Both valves closed.
2. Plug fires.
3. Exhaust valve only (closed)
4. Intake valve only (open)

Objective #4: The student will increase in comprehension of camshaft-crankshaft-piston relationship by translating the movement of the following into corresponding movements of the remaining two:

1. Piston moves TDC to BDC.
2. Crank 1 full revolution.
3. Camshaft 1/2 revolution.
4. Crank 2 full revolutions.
5. Piston 3 strokes.

MAJOR OBJECTIVE

THE STUDENT WILL APPLY KNOWLEDGE OF THE PERFORMANCE OF MAINTENANCE SERVICES AS REQUIRED BY AUTOMOTIVE MANUFACTURERS.

Objective #1: The student will apply the correct methods of lubrication by satisfactorily completing the following suggested activities to the satisfaction of the teacher.

Activities:

1. Use a lube chart.
2. Grease all fittings.
3. Check transmission and differential fluids.
4. Make a safety inspection of undercarriage.
5. Drain and fill air.
6. Change air filter cartridge.
7. Inspect all fluids under hood.

Objective #2: The student will display knowledge of automotive fluid classifications by explaining the following symbols to the satisfaction of the teacher.

Explain:

1. MS, ML, MM.
2. SA, SB, SD, SE.
3. SAW -10-20-30
4. Type A - dextron
5. H.D.

Objective #3: The student will apply knowledge of wheel bearing packing by satisfactorily engaging in the following activities to be measured by teacher evaluation.

Activities:

8. Remove front drum.
9. Remove inner bearing and grease seal.

10. Recognize defects in bearings.

11. Identify ball and roller type bearing.

12. Identify race, cup and spindle.

13. Clean and repack bearings.

14. Adjust front bearing according to manufacturers specifications.

Objective #4: The student will apply knowledge of front end wear by inspecting the following components in accordance with an instructional check chart.

Inspect:

1.Upper and lower ball joints.

2.Steering linkage.

3.Control arm bushings.

4.Tire wear.

Objective #5: The student will properly perform a speedometer cable lubrication.

Objective #6: The student will display knowledge of automotive filters by completing the following activities. Evaluation to be made by teacher.

Activities:

15. Identify four kinds of air filters.

16. Explain how to service them.

17. Explain the two types of air flow systems.

18. Explain the difference between cartridge and throw away air filters.

Objective #7: The student will apply knowledge of the use of motor manuals and specification charts by correctly looking up the following specifications.

Look up:

1. Point gap 1965 Chevy Six.
2. Cam angle 1970 Ford 302 ci V8.
3. Bore 1968 Plymouth 318 ci V8.
4. Oil capacity 1966 Chevy 327 ci V8.
5. Timing location 1971 Plymouth slant six.

MAJOR OBJECTIVE :

THE STUDENT WILL APPLY KNOWLEDGE OF COOLING SYSTEM FUNDAMENTALS AND SERVICE PROCEDURES BY SUCCESSFULLY DIAGNOSING AND REPAIRING VARIOUS COOLING SYSTEM MALFUNCTIONS.

Objective #1: The student will increase in comprehension of water transfer and parts function by sketching a cooling system, including the following activities to the satisfaction of the teacher.

Activities:

1. Sketch direction of water flow shown.
2. Label all parts.
3. Color hot water area red and cooler water area blue.

Objective #2: The student will apply knowledge of seasonal maintenance services by completing the following activities to the satisfaction of the teacher.

Activities:

4. Drain a radiator and block.
5. Flush system.
6. Install antifreeze.

Objective #3: The student will apply knowledge of repairing defects in the cooling system by completing the following activities.

Activities:

7. Remove and replace a radiator.
8. Remove and replace a hose.
9. Remove and replace a water pump.
10. Remove and replace an expansion plug.
11. Remove and replace a thermostat.

Objective #4: The student will apply knowledge of cooling system problems by completing the following activities to be measured by teacher evaluation.

Activities:

12. Pressure check for leaks.
13. Test a thermostat.
14. Recognize a clogged system.
15. Test a pressure cap.
16. Recognize a defective pump.
17. List the four major causes of overheating as stated in shop check chart.

TIRES, WHEELS AND RIMS

MAJOR OBJECTIVE I:

THE STUDENT WILL DISPLAY COMPREHENSION OF CONSUMER INFORMATION ABOUT TIRES.

MAJOR OBJECTIVE II:

THE STUDENT WILL APPLY ACCEPTABLE METHODS OF REPAIR AND CARE OF TIRES AS INDICATED BY A WRITTEN TEST AND TEACHER OBSERVATION.

Objective #1: The student will display knowledge of tire and rim sizes by explaining the following tire ratings to the satisfaction of the teacher.

Explain:

1. H - 78 - 14
2. 735 x 14

Objective #2: The student will display knowledge of consumer information about tires by explaining the following tire descriptions to the satisfaction of the teacher.

Explain:

1. Ply
2. Belted
3. Radial
4. 2 ply 4 ply rating
5. Bias construction
6. Wide oval
7. Polyester cords

Objective #3: The student will apply knowledge of tire service by completing the following activities as measured by the teacher.

Activities:

1. Mount a tubeless tire on a rim.
2. Patch a tube.

3. Plug a tubeless tire.

4. Patch a tubeless tire (inside).

5. Fix a bead leak.

6. Install a tubeless tire stem.

7. Locate a slow leak in a tubeless tire.

8. Inflate tire to proper pressure.

Objective #4: The student will apply knowledge of proper tire care by completing the following activities as evaluated by teacher.

Activities:

9. Perform a 5 tire rotation.

10. Recognize at least 4 abnormal tire wear patterns.

11. Balance 2 tires.

MAJOR OBJECTIVE:

THE STUDENT WILL APPLY KNOWLEDGE OF HYDRAULIC BRAKE SERVICES BY SUCESSFULLY COMPLETING A BRAKE JOB ON AUTOMOBILE AS OBSERVED BY INSTRUCTOR.

Objective #1 The student will apply knowledge of hydraulic fundamentals and service by completing the following activities. to the satisfaction of the teacher.

Activities:

1. Repair a wheel cylinder.
2. Rebuild a master cylinder.
3. Identify a defective cylinder.
4. Bleed a hydraulic system.

Objective #2: The student will apply knowledge of brake service by completing the following activities to the satisfaction of the teacher.

Activities:

5. Replace brake shoes (front).
6. Replace brake shoes (rear).
7. Adjust an emergency brake.
8. Adjust brakes.
9. Cut a brake drum on a lathe.
10. Replace disc brake pads.
11. Recognize defective brake shoes.

Objective #3: The student will demonstrate application of knowledge of brake system theory by sucessfully (70%) passing a written test on brake theory to include the following areas.

Activities:

1. Basic hydraulics.
2. Shoes and lining construction.

3. Hydraulic service.
4. Mechanical parts function.
5. Causes of brake complaints and troubles.

MAJOR OBJECTIVE:

THE STUDENT WILL COMPREHEND THE FUNDAMENTAL OF BASIC ELECTRICITY AS APPLIED TO AUTOMOTIVE SYSTEMS.

Objective #1: The student will display knowledge of basic electrical vocabulary by suppling meanings to the following words to the satisfaction of the teacher.

Define:

1. volts.
2. amps.
3. ohms.
4. circuits (types).
5. ac-dc.

Objective #2: The student will increase comprehension of electrical measuring instruments by correctly performing the following shop experiments. to the satisfaction of the teacher.

Activities:

1. Measure volts in ignition primary circuit.
2. Measure amperes in charging circuit.
3. Measure resistance in a secondary wire.

Objective #3: The student will display knowledge of basic electrical principles by explaining the following terms on a written test.

Explain:

4. Electromagnet.
5. Induction.
6. Solenoid principle.
7. Circuit breaker.
8. Hot wire circuit.

LEVEL OBJECTIVE:

THE STUDENT WILL INCREASE IN KNOWLEDGE OF BATTERY TESTING AND SERVICE BY PERFORMING BATTERY EVALUATION ACCORDING TO MANUFACTURERS RECOMMENDATIONS.

Objective #1: The student will display his knowledge of battery construction by completing the definitions of the following terms to the satisfaction of the teacher.

Define:

1. Plate.
2. Grid.
3. Cell.
4. Electrolyte solution.
5. Sulphation.
6. Chemical action.
7. Discharge action.

Objective #2: The student will apply knowledge of battery testing by completing the following activities and report results to instructor.

Activities:

1. Perform hydrometer test.
2. Perform cell test.
3. Perform load test.

Objective #3: The student will apply knowledge of battery care by performing the following services to be evaluated by instructor.

Activities:

4. Remove and replace battery cables.
5. Clean cables and posts.

6. Clean top of battery with a baking soda solution.
7. Slow charge a battery.
8. Fast charge a battery.

LEVEL OBJECTIVE:

THE STUDENT WILL APPLY THE PRINCIPLES INVOLVED IN THE AUTOMOTIVE IGNITION SYSTEM BY PERFORMING SERVICES RECOMMENDED BY THE MANUFACTURER.

Objective #1: The student will apply knowledge of related steps on a V-8 engine by engaging in the following activities to the satisfaction of the teacher.

Activities:

1. Remove spark plugs from engine and:
   a. inspect.
   b. clean and file.
   c. gap.
   d. test.
2. Remove and replace points and:
   a. gap.
   b. measure cam angle.
3. Set engine timing to specifications.
4. Inspect or replace distributor cap and rotor.
5. Remove and replace spark plugs.

Objective #2: The student will apply knowledge of the diagnosis of defective ignition parts by performing the following tests to the satisfaction of the teacher.

Activities:

6. Test secondary wires.
7. Test ballast resistor.
8. Perform compression test.
9. Test coil.
10. Remove and replace distributor.

Objective #3: The student will apply knowledge of trouble shooting ignition system defects by starting engines made defective by the instructor.

Objective #4: The student will demonstrate his comprehension of ignition theory by sucessfully passing (70%) an ignition system examination composed by the instructor.

LEVEL OBJECTIVE:

THE STUDENT WILL APPLY KNOWLEDGE OF CRANKING SYSTEM FUNDAMENTALS AND STARTER REPAIR, BY PERFORMING CRANKING SYSTEM SERVICE ON AUTOMOBILE ENGINES.

Objective #1: The student will increase in comprehension of starter motors by engaging in the following activities to the satisfaction of the teacher.

Activities:

1. Name 5 internal parts.
2. Disassemble a starter.
3. Test armature, commutator, and fields.
4. Install brushes.
5. Re-assemble starter.
6. List 5 causes of starter failure.
7. Rebuild a G.M. type solenoid.

Objective #2: The student will apply his knowledge of the cranking system to diagnose cranking problems by engaging in the following activities to be evaluated by teacher.

Perform:

a. Starter draw test.
b. Voltage drop test(s).
c. Solenoid testing.
d. Neutral safety switch test.
e. Reviewing battery tests.

Objective #3: The student will apply knowledge to the servicing of cranking systems by performing the following activities to be measured by teacher evaluation.

Activities:

8. Remove and replace starter (V8).
9. Remove and replace solenoid.
10. Remove and replace neutral safety switch.
11. Remove and replace bendix drive.

LEVEL OBJECTIVE:

THE STUDENT WILL DEMONSTRATE RECALL OF KNOWLEDGE LEARNED IN AUTO MECHANICS I.

Objective #1: The student will demonstrate his ability to perform basic service operations previously learned by completing the following suggested activities as observed by the instructor.

Activities:

1. Install points and condenser.
2. Use a dwell meter.
3. Time an engine.
4. Replace brake shoes.
5. Bleed a brake system.
6. Check starter draw.
7. Hydrometer test a battery.
8. Load test a battery.
9. Adjust carburetor RPM's.
10. Pack a wheel bearing.
11. Pressure check a cooling system.
12. Plug a tubeless tire

Objective #2: The student will display his knowledge of basic automotive theory by sucessfully passing a pre-test (70%) issued by the instructor. The test will consist of 5 questions in each of the following areas:

1. Brakes
2. Tires
3. Cooling System
4. Engine Operational Theory

5. Ignition Systems.
6. Cranking System.
7. Batteries.
8. Lubrication and Maintenance Service.

LEVEL OBJECTIVE:

THE STUDENT WILL APPLY KNOWLEDGE OF CHARGING SYSTEM THEORY AND SERVICE.

Objective #1: The student will display knowledge of generators by completing the following suggested activities to the satisfaction of the teacher.

Activities:

1. Disassemble a generator.
2. Name 5 parts of the generator.
3. Make bench tests of internal parts.
4. List 4 causes of generator failure.
5. Reassemble generator.

Objective #2: The student will increase in comprehension of generator charging system service by performing the following activities to the satisfaction of the teacher.

Activities:

6. Remove and replace a generator.
7. Remove and replace a regulator.
8. Adjust a voltage regulator using a Volt-Amp Meter.
9. Test generator and regulator output.

Objective #3: the student will display knowledge of alternators by performing the following activities to be measured by teacher observation.

Activities:

10. Disassemble an alternator.
11. Name 5 parts of the alternator.
12. Bench test internal parts.
13. List 4 causes of failure of the alternator.
14. Remove a diode.
15. Reassemble alternator.

Objective #4: The student will increase in comprehension of alternator charging system by performing the following activities to the satisfaction of the teacher.

Activities:

16. Remove and replace an alternator.

17. Remove and replace a regulator.

18. Perform an alternator output test.

19. Perform a regulator test.

Objective #5: The student will demonstrate his knowledge of charging systems theory by sucessfully (70%) passing a written test on the following items:

1. Generator construction and testing.
2. Alternator construction and testing.
3. Output regulation.
4. Trouble diagnosis.

LEVEL OBJECTIVE:

THE STUDENT WILL APPLY KNOWLEDGE OF THE USE OF TECHNICAL ELECTRICAL TESTING EQUIPMENT.

Objective #1: The student will increase in knowledge of distributor service by completing the following suggested activities to the satisfaction of the teacher.

Activities:

1. Remove distributor from engine.
2. Install distributor in syncrograph.
3. Perform the following tests to the distributor while it is in syncrograph.
   a. point resistance.
   b. point spring tension.
   c. cam angle.
   d. distributor wear.
   e. centrifugal advance.
   f. vacuum advance.
4. Install distributor in engine.
5. Start engine and time.

Objective #2: The student will demonstrate the application of his knowledge of engine diagnosis by completing the following activities to the satisfaction of the teacher.

Activities:

6. Hook up scope analyzer to engine.
7. Perform the tests recommended in scope check list.
8. Turn in check list to instructor.

LEVEL OBJECTIVE:

THE STUDENT WILL APPLY KNOWLEDGE OF THE FUEL SYSTEM AND CARBURETOR SERVICE.

Objective #1: The student will increase in knowledge of fuel system theory by completing the following suggested activities to the satisfaction of the teacher.

Activities:

1. List 5 fuel system parts.
2. Explain operation of fuel pumps.
3. Remove and replace a fuel pump.
4. Test fuel pump output and pressure.
5. Replace a fuel line.
6. Test and replace a fuel tank sender gauge.
7. Replace and service a fuel line filter.

Objective #2: The student will apply knowledge of carturetor by rebuilding the three carburetors listed below under observation of the instructor.

Activities:

8. Rebuild: 1 Barrel Rochester
   2 Barrel Carter
   4 Barrel Holley

Objective #3: The student will apply knowledge of diagnosis and adjustments on shop engines as observed by the instructor.

Activities:

9. Set engine RPM.
10. Set idle mixture.
11. Set fast idle RPM.
12. Set a choke.
13. Use a combustion analyzer to set idle mixture.

LEVEL OBJECTIVE:

THE STUDENT WILL APPLY KNOWLEDGE OF ENGINE REPAIR BY PERFORMING ENGINE SERVICES AS REQUIRED BY MANUFACTURERS.

Objective #1: The student will demonstrate application of engine theory by successfully passing (70%) of a written test which will include the following categories:

1. operational theory
2. engine ratings
3. piston and ring service
4. crank and bearing service
5. value train service
6. block and seal service
7. engine testing methods
8. lubrication systems

Objective #2: The student will apply knowledge of proper value service procedure by completing the following activities to the satisfaction of the teacher.

Activities:

1. Adjust valve lash.
2. Remove cylinder heads.
3. Remove valves from cylinder head.
4. Clean and re-face valves.
5. Clean and cut valve seats.
6. Lap in valves and explain why this step is necessary.
7. Inspect valve guides.
8. Assemble valves in head.
9. Install heads on engine.

Objective #3: The student will apply knowledge of engine disassembly by performing the following activities to the satisfaction of the teacher.

Activities:

10. Remove intake manifold.
11. Remove cylinder.
12. Cut piston ridge.
13. Remove air pan.
14. Remove rod cap and remove piston.
15. Remove valve lifters.
16. Remove cam shaft.
17. Remove flywheel.
18. Remove timing, chain cover and chain.
19. Remove main caps and remove crank and bearings.

Objective #4: The student will apply knowledge of the diagnosis and service of engine parts by completing the following activities to the satisfaction of the teacher.

Activities:

20. Make crankshaft journals.
21. Measure cylinder wall tape with a dial indicator.
22. Make piston skirt.
23. Clean ring grooves.
24. Clean and inspect all parts for wear.
25. Inspect old bearings for abnormal wear patterns.
26. Identify all seals and explain their functions.
27. Inspect oil pump.

Objective #5: The student will apply proper overhaul procedures by reassembling an engine using the following procedure to the satisfaction of the teacher.

Activities:

28. Identify all engine marking procedures (EG rod cap alignment).
29. Look up torque specifications for all parts concerned.
30. Assemble engine using manufacturer's shop manual steps.

Objective #6: The student will apply knowledge of engine testing and diagnosis methods by completing the following activities to the satisfaction of the teacher.

Activities:

31. Perform compression test.
32. Create dynamic compression with scope.
33. Perform vacuum gauge tests.
34. Recognize 5 engine noises.
35. Perform cylinder balance test.
36. Perform cylinder leakage test.

TUNE UP AND COMPRESSION

LEVEL OBJECTIVE:

THE STUDENT WILL APPLY PROPER TUNE UP SERVICE PROCEDURE BY TUNING UP AT LEAST TWO AUTOMOBILE ENGINES.

Objective #1: The student will apply knowledge of a tune up in the proper sequence as listed in the shop work book by putting together all the services learned in Auto I and Auto II to the satisfaction of the teacher.

Objective #2: The student will apply his knowledge of compression testing as related to engine tune up by completing the following activities to the satisfaction of the teacher.

Activities:

1. Explain the relationship of compression testing to engine tuneup.
2. Perform a compression test in the proper sequence of engine tuneup.
3. Diagnose results.

LEVEL OBJECTIVE:

THE STUDENT WILL APPLY HIS KNOWLEDGE OF FRONT END SERVICE BY PARTICIPATING IN RECOMMENDED MANUFACTURERS SERVICES.

Objective #1: The student will apply knowledge of front end alignment by completing the following suggested activities to the satisfaction of the teacher.

Activities:

1. Adjust car height (Chrysler products).
2. Adjust camber.
3. Adjust caster.
4. Adjust toe in.

Objective #2: The student will apply his knowledge of steering mechanisms by completing the following activities to the satisfaction of the teacher.

Activities:

5. Remove a tie rod end.
6. Remove an idler arm.
7. Remove a steering box.
8. Disassemble, check, and reassemble the following:
   a. manual steering box.
   b. power steering box.
   c. power steering pump.

Objective #3: The student will demonstrate his knowledge of front end theory by successfully passing a written test (70%) that includes the following areas.

1. Front end parts function.
2. Principles of alignment.
3. Principles of steering geometry.
4. Service procedures.

MAJOR OBJECTIVE

THE STUDENT WILL INCREASE COMPREHENSION OF COMMON AUTO SHOP HAZARDS, AND RULES TO FOLLOW FOR SAFE CONDITIONS WHILE WORKING IN THE SHOP AS MEASURED BY A WRITTEN TEST AND/OR INSTRUCTOR OBSERVANCE OF WORK HABITS.

Objective #1: The student will display knowledge of safety rules by engaging in class discussion concerning common shop hazards as they pertain to the auto mechanics shop.

Activities

1. List fire hazards.
2. Jack a car 15" from ground level.
3. Lift a car 72" from ground level.
4. Describe proper protective clothing and equipment.
5. Discuss moving hazards (fans, autos, machinery)
6. Clean up shop.
7. Describe how to use muscle system effectively, without injury.

Objective #2: The student will display knowledge of shop hazards and safety rules by listing from memory 10 safety rules as they pertain to the auto shop.

Objective #3: The student will display competence in his knowledge of proper work habits for the protection of injuries to himself and others as observed by the instructor in performing his assigned work activities in the shop and measured by teacher observation.

MAJOR OBJECTIVE

THE STUDENT WILL INCREASE COMPREHENSION OF BASIC HAND TOOLS USED IN THE AUTO SHOP AS MEASURED BY AN ORAL TEST CONSISTING OF TOOL IDENTIFICATION, TOOL USE, AND TOOL MAINTENANCE IN USE.

Objective #1: The student will display knowledge of tools used for minor repair and tune up procedures by correctly locating the appropriate tools as they are located in the tool room to the satisfactio. of the teacher.

Activities:

1. List types of wrenches.
2. Describe socket sets. (1/4" drive thru 3/4" drive)
3. List types of plyers.
4. List types of screwdrivers.
5. Discuss types of cleaning equipment (brushes, scrapers).
6. List types of cutting tools (saws and chisels).
7. Describe types of hammers.
8. Discuss types of measuring devices. (Hydrometer, feeler gauges, mikes, etc.)

Objective #2: The student will identify and state the use of 168 tools as pictured on flash cards when called on by the instructor.

Objective #3: The student will display knowledge of the maintenance of tools when completing assigned orientation work activities, as observed by the instructor.

MAJOR OBJECTIVE
THE STUDENT WILL DEMONSTRATE APPLICATION OF THE USE OF BASIC AUTOMOTIVE HAND TOOLS, AND PERFORM JOBS FOLLOWING THE SAFETY RULES OF THE SHOP AS INDICATED BY TEACHER OBSERVATION.

Objective #1: The student, using the necessary tools, will successfully perform the following activities to the satisfaction of the teacher.

Activities:

1. Cut and flare copper tubing.
2. Make a gasket.
3. Cut, strip insulation, and install a terminal on 14 gauge wire.
4. Solder terminal in job 3.
5. Torque a spark plug to 15 ft. lbs.
6. Clean, file, gap a spark plug.

7. Press a bearing off a shaft using a hydraulic press.

8. Inflate a tire to 30 PSI using a pressure gauge.

9. Remove and replace a tire & rim assembly from a supported chassis work station in the shop.

Objective #2: The student, following the list of shop safety rules, will successfully perform the following activities to the satisfaction of the teacher.

Activities :

10. Jack a car, using both bumper and floor jacks.

11. Support a car with safety stands.

12. Install compressed air attachments.

MAJOR OBJECTIVE

THE STUDENT WILL INCREASE COMPREHENSION OF THE NAMES AND FUNCTIONS OF ENGINE POWER PLANT PARTS AS MEASURED BY A WRITTEN TEST CONSISTING OF PARTS IDENTIFICATION, FUNCTION AND PLACEMENT IN SYSTEMS.

Objective #1: The student will display knowledge of engine supportive systems by pointing out three complete systems on engines set up in the shop, and state the main function of these systems.

Activities

1. Describe each of the following:

a. Ignition system
b. Lubrication system
c. Cooling system
d. Fuel system
e. Charging system
f. Cranking system

Objective #2: The student will display knowledge of engine parts by identifying fifteen out of twenty engine parts and correctly stating their functions on a written test.

Activities:

2. Describe a power train. (piston assy., rods, crankshaft)

3. Describe a valve train. (cam shaft, lifters, push rods, valves, etc.)

4. Describe a block assembly. (passageways, bores, etc.)

MAJOR OBJECTIVE

THE STUDENT WILL INCREASE COMPREHENSION OF THE 4 STROKE CYCLE PRINCIPLES AND ENGINE CONSTRUCTION BY SKETCHING AN ENGINE SHOWING ITS STROKES IN OPERATION, AS MEASURED BY TEACHER OBSERVATION.

Objective #1: The student will display knowledge of engine block shapes by identifying the following given shapes of blocks to the satisfaction of the teacher.

Activities:

1. Identify and explain the following:

a. V
b. Slant
c. Inline
d. Opposed

Objective #2: The student will display knowledge of engine construction types by assembling from cardboard cut-out parts the following types of engines to the satisfaction of the teacher.

Activities:

2. Assemble each of the following:

a. Flathead
b. Overhead cam
c. Overhead valve
d. Rotary piston

Objective #3: The student will display knowledge of 4 stroke cycle principle by naming the stroke when the following action takes place to the satisfaction of the teacher.

Activities:

3. As cycle is taking place, point out the following:

a. Both valves closed
b. Plug fires
c. Exhaust valve open, intake valve closed
d. Intake valve open, evhaust valve closed.

MAJOR OBJECTIVE

THE STUDENT WILL INCREASE COMPREHENSION OF AUTOMOTIVE TERMINOLOGY AS IT APPEARS IN TUNE-UP SPECIFICATION CHARTS AND VARIOUS AUTO REPAIR MANUALS, AS MEASURED BY A WRITTEN TEST.

Objective #1: The student will be able to explain in his own words when called upon the following terms to the satisfaction of the teacher.

Activities:

1. Explain:

a. TDC, BDC
b. Dwell or cam angle
c. Contact point gap
d. Ignition timing, Firing Order, #1 Spark plug
e. RPM
f. Hot idle, fast idle, shut down idle
g. Compression ratio, cubic inches, horse power.

Objective #2: The student, given a tune-up specification chart, will be able to correctly locate the following information to the satisfaction of the teacher.

Activities:

2. Locate the following:

a. Ignition timing, '66 Pontiac Tempest 6 cyl eng.,
b. Cam Angle, '72 Chevrolet Impala 350 CI engine,
c. Point Gap, '62 Chevrolet 6 cyl. eng.,
d. Hot idle, fast idle, shut down idle, '73 Cadillac, Auto Trans w/air cond.,
e. Firing Order and position #1 Spark plug, '68 Thunderbird 390 CI eng.

Objective #3: The student will demonstrate application of positioning #1 piston at TDC, under the supervision of the teacher.

Objective #4: The student will increase in comprehension of camshaft-crankshaft-piston relationship by translating the movement of the following into corresponding movements of the remaining two to the satisfaction of the teacher.

a. Piston moves TDC to BDC
b. Crank 1 full revolution
c. Camshaft 1/2 revolution
d. Crank 2 full revolutions
e. Piston 3 strokes

MAJOR OBJECTIVE:

THE STUDENT WILL APPLY THE PRINCIPLES AND THEORY INVOLVED IN THE AUTOMOTIVE IGNITION SYSTEM BY PERFORMING TESTS, ADJUSTMENTS, AND ROUTINE SCHEDULED REPAIRS AS RECOMMENDED BY AUTO MANUFACTURERS, AND IGNITION MANUFACTURERS.

Objective #1: The student will apply knowledge of related steps on an American-made 6 or 8 cylinder engine ignition system by engaging in the following activities to the satisfaction of the teacher.

Activities:

1. Remove spark plugs from engine and:

   a) read condition, make conclusion as to condition.

   b) clean, file, regap.

   c) test.

   d) install in engine with torque wrench.

2. Remove points from distributor and:

   a) inspect condition, make conclusion as to condition.

   b) lubricate distributor, inspect.

   c) install points in distributor, gap, start engine, read cam angle.

3. Inspect condition of distributor cap and rotor, make conclusions, replace.

4. Connect timing light to ignition system, also dwell-tach, and

   a) inspect action of centrifugal and vacuum advance.

b) set idle RPM to specifications.

c) set timing to specifications.

Objective #2: The student will apply knowledge to diagnosis of defective ignition system parts by performing the following tests to be measured by teacher observation.

Activities:

5. Test carbon spark plug wires and:

   a) make sketch of engines secondary wiring diagram from firing order.

6. Test ballast resistor.

7. Perform compression test.

8. Test coil.

9. Remove, inspect, replace distributor.

Objective #3: The student will apply knowledge of trouble shooting ignition system defects by starting engines made defective by the instructor.

Objective #4: The student will demonstrate his comprehension of ignition system theory by successfully passing (70%) an ignition system examination composed by the instructor.

MAJOR OBJECTIVE

THE STUDENT WILL APPLY KNOWLEDGE OF COOLING SYSTEM FUNDAMENTALS AND SERVICE PROCEDURES BY SUCCESSFULLY DIAGNOSING AND REPAIRING COMMON COOLING SYSTEM MALFUNCTIONS.

Objective #1: The student will increase in comprehension of water transfer and parts function by sketching a cooling system, including the following activities to the satisfaction of the teacher.

Activities

1. Show direction of water flow shown.

2. Label all parts.

3. Show proper way to make back-flush connections.

Objective #2: The student will apply knowledge of seasonal maintenance services by completing the following activities to the satisfaction of the teacher.

Activities:

4. Check strength of ethelene glycol and:

   a) determine if cooling system needs additional amounts of anti-freeze.

   b) determine how much anti-freeze is needed to protect an 18 quart system from freezing when the atmospheric temp. is -20 deg.F.

Objective #3: The student will apply knowledge to repair defects in the cooling system by completing the following activities to the satisfaction of the teacher.

Activities:

5. Remove and replace a water pump, inspect bearing and seal.

6. Remove and replace a thermostat, test.

Objective #4: The student will apply knowledge of cooling system problems by completing the following activities to the satisfaction of the teacher.

Activities:

7. Pressure check for leaks.

8. Recognize a clogged system.

9. Test a pressure cap.

10. List the four main causes of overheating as stated in shop check chart.

11. List the steps taken in cooling down an overheated engine.

MAJOR OBJECTIVE

THE STUDENT WILL APPLY KNOWLEDGE OF CRANKING SYSTEM FUNDAMENTALS AND SERVICE PROCEDURES BY SUCCESSFULLY DIAGNOSING AND REPAIRING COMMON CRANKING SYSTEM MALFUNCTIONS.

Objective #1: The student will increase in comprehension of electrical circuits and parts function by sketching a typical cranking system, including the following activities to the satisfaction of the teacher.

Activities:

1. Construct a schematic drawing of electrical circuits.
2. Label all parts.
3. Indicate direction of current flow.

Objective #2: The student will apply knowledge of periodic maintenance services by completing the following activities to the satisfaction of the teacher.

Activities:

4. Remove, inspect, clean battery terminals.
5. Clean battery.
6. Measure specific gravity of battery to determine state of charge.
7. Inspect battery cables.

Objective #3: The student will apply knowledge to repair defects om the cranking system by completing the following activities.

Activities:

8. Remove, test, replace solenoid.
9. Remove, bench test, replace starter.
10. Fast charge battery, perform 3 minute charge test.

11. 24 hr. slow charge with comparison of specific gravity readings.

LEVEL OBJECTIVE:

THE STUDENT WILL APPLY KNOWLEDGE OF FUEL SYSTEM FUNDAMENTALS AND SERVICE PROCEDURES BY SUCCESSFULLY DIAGNOSING AND REPAIRING COMMON FUEL SYSTEM MALFUNCTIONS.

Objective #1: The student will increase in comprehension of fuel flow and parts function by sketching a fuel system, to be measured by teacher observation.

Activities:

1. Follow direction of fuel flow, indicating how fuel is made to flow.
2. Label all parts.
3. Find the location of filters.
4. Locate fuel PSI in the system.

Objective #2: The student will apply knowledge of periodic maintenance services by completing the following activities.

Activities:

5. Check in-line fuel filter, remove and replace.
6. Check serrated bronze filter, remove, clean, replace.
7. Clean and adjust carburetor fuel air mixture and idle RPM.

Objective #3: The student will apply knowledge to repair defects in the fuel system by completing the following activities to the satisfaction of the teacher.

Activities:

8. Remove and replace fuel pump.
9. Remove and replace carburetor.

Objective #4: The student will apply knowledge of fuel system problems by completing the following activities to the satisfaction of the teacher.

Activities:

1. Complete fuel pump test for pressure and capacity.
2. Perform check for restrictions in fuel line.

LEVEL OBJECTIVE:

THE STUDENT WILL APPLY KNOWLEDGE OF THE PERFORMANCE OF COMMON MAINTENANCE SERVICES AS REQUIRED BY AUTOMOTIVE MANUFACTURERS.

Objective #1: The student will apply the correct methods of lubrication by satisfactorily completing the following activities to the satisfaction of the teacher.

Activities:

1. Use a lube chart.
2. Grease all fittings.
3. Check transmission and differential fluid.
4. Complete safety inspection of undercarriage.
5. Drain and fill oil, change oil filter.
6. Inspect all fluids under hood.

Objective #2: The student will display knowledge of automotive fluid classifications by explaining the following symbols to the satisfaction of the teacher.

Activities:

7. Explain the following:

   SA, SB, SD, SE,
   SAE 10-20-30,
   Type A - dextron, and
   H.D.

Objective #3: The student will apply knowledge of front end wear by inspecting the following components in accordance with an instructional check chart to the satisfaction of the teacher.

Activities:

8. Inspect the following:

a. Upper and lower ball joints
b. Steering linkage
c. Control arm bushings
d. Tire wear

Objective #4: The student will display knowledge of automotive filters by completing the following activities to the satisfaction of the teacher.

Activities:

9. Identify four kinds of air filters and how to service each.

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AUTO MECHANICS FOR GIRLS

INTRODUCTORY NOTE:

Basic Curriculum for Auto Mechanics for Girls

The auto mechanics course for girls utilizes the same basic objectives as those written for Basic Auto Mechanics. A different emphasis is provided for girls who have practically no previous knowledge of automotive mechanics and do not intend to pursue the subject further. The following outline suggests the emphasis.

Topic 1 (beginning of the course): Parts of a Car

A moderately detailed study of the various parts of an automobile .

Topic 2: How a Car Works

The physics and chemistry involved in the workings of a car and how all the parts previously discussed work together to make the car run.

Topic 3: What Goes Wrong with a Car

The simple and complicated problems that cause the car to malfunction. Items to be discussed should include tires, spark plugs and points, oil, battery, radiators, carburator, fan belt, muffler, etc.

Topic 4: Sensing What is Wrong

The teacher should try to make the student sensitive to the things which are clues to automotive troubles. For example, swerving when coming to a stop suggests poor wheel alignment, and hesitation when starting may be caused by the kind of gasoline used etc.

Topic 5: Automotive Tools

This portion of the course explains how the various tools are used to make repairs on a car.

Topic 6: Fixing a Car

Repair or replacement of some of the more accessible auto parts: carburetor, fan belt, points, tire, etc.

Topic 7: Miscellaneous

1) Consumer Services:
   a) how much certain repairs normally cost
   b) the different brand-name cars, what added options they include, and how much they cost
   c) maintenance of your car

2) Safety Features:
   a) a discussion of the various safety devices presently used in cars and what is proposed for the future
   b) burgler-proof features of modern cars
   c) anti-pollution devices and their effect on cars